suspicious areas. The von Pirquet test, March 21, 1918, was reported positive by Dr. Jersky.

The complement fixation test made independently by Drs. H. R. Miller and Jersky were reported as weakly positive.

The patient made a good recovery and was discharged, March 26, 1918, apparently well.

63 East Eighty-Fourth Street.

SERUM TREATMENT OF POSTINFLUENZAL BRONCHOPNEUMONIA *

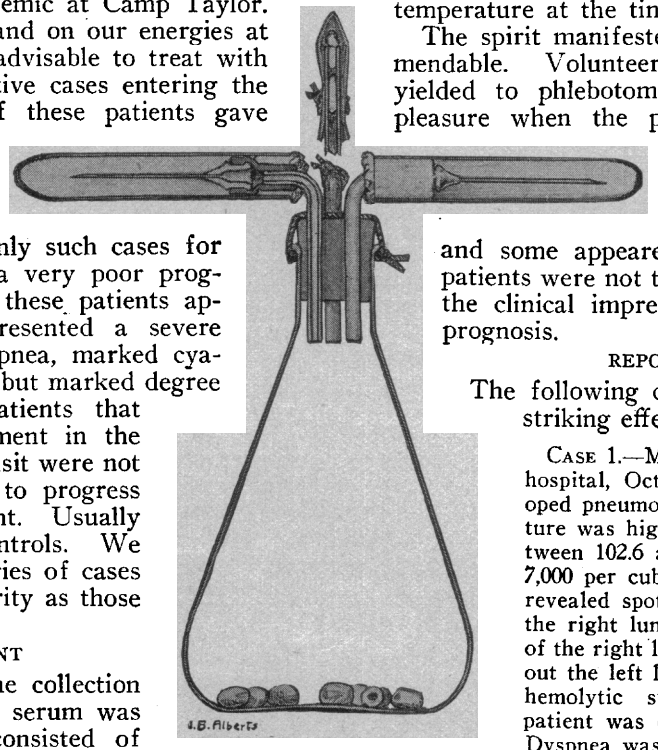
MORRIS H. KAHN, M.D. (NEW YORK)
Lieutenant, M. C., U. S. Army
CAMP ZACHARY TAYLOR, LOUISVILLE, KY.

The use of serum from patients convalescing from postinfluenzal bronchopneumonia in the treatment of this disease was suggested by the author early during the appearance of the epidemic at Camp Taylor. As there was a great demand on our energies at the time, it did not seem advisable to treat with serum a series of consecutive cases entering the hospital, because many of these patients gave promise of recovering without it, and the treatment would have been superfluous.

We therefore selected only such cases for serum treatment as gave a very poor prognosis clinically. Some of these patients appeared moribund. All presented a severe toxemia with extreme dyspnea, marked cyanosis, fever, and a variable but marked degree of lung involvement. Patients that showed signs of improvement in the day or two preceding our visit were not treated, as they promised to progress favorably without treatment. Usually these were selected as controls. We thus used as controls a series of cases of the same type and severity as those we treated.

SERUM TREATMENT

The method used for the collection and the preparation of the serum was simple. The apparatus consisted of 500 c.c. Erlenmeyer flasks fitted with rubber stoppers through which three L-shaped tubes led outward. To two of these a large-caliber needle was attached by means of a short piece of rubber tubing, and protected by a glass covering as shown in the illustration. The third piece of glass tubing was plugged with cotton and used as an exhaust for suction when the blood was being drawn.



Apparatus for collection of serum.

The blood was taken under sterile precautions from the elbow veins, with a tourniquet around the arm. We collected from 300 to 400 c.c. from each donor. Two donors felt faint during the phlebotomy, but no other consequences were noted.

The blood was allowed to stand for from twelve to eighteen hours in the refrigerator. The serum was then decanted under sterile precautions and tested for complement fixation against syphilis. Serum showing a positive Wassermann reaction was discarded. It was deemed unnecessary to test hemolytic or hemagglutinative reactions between the bloods of donor and recipient, as the amounts were not sufficient to make these reactions in the circulation of consequence. The serums of two or three donors were mixed and about 100 c.c. were given intravenously at each injection. Most of the patients received two injections within twenty-four hours. A few received three injections and some, the apparently moribund patients, necessarily had only one injection. In some of the cases a preliminary phlebotomy of a small amount of blood was done. The details will be mentioned in the case reports.

Convalescent influenza patients and influenzal bronchopneumonia patients were used as donors. In the treatment of the last twenty cases of our series only bronchopneumonia convalescents were used. We chose preferably full-blooded large-built individuals in whom the disease had been severe. In most of these, less than one week had elapsed of normal temperature at the time of phlebotomy.

The spirit manifested by the donors was commendable. Volunteers responded heartily and yielded to phlebotomy with an avowed heroic pleasure when the purpose of the work was stated to them.

The patients were all in a very critical condition at the time of the injection, and some appeared moribund. The control patients were not treated because they all gave the clinical impression of a more favorable prognosis.

REPORT OF CASES

The following cases especially indicate the striking effects of the serum treatment:

CASE 1.—Major A. D. C., admitted to the hospital, October 14, with influenza, developed pneumonia, October 21. The temperature was higher, October 22. It ranged between 102.6 and 99.4. The leukocytes were 7,000 per cubic millimeter. Roentgenoscopy revealed spot shadows in the upper lobe of the right lung, a shadow in the lower lobe of the right lung, and spot shadows throughout the left lung. The sputum showed nonhemolytic streptococci. October 25, the patient was extremely toxic and jaundiced. Dyspnea was marked, cyanosis was present, and the patient was dull mentally. At 4:30 p. m., 100 c.c. of serum were given after a preliminary phlebotomy of about 60 c.c. of blood. Within six hours there was much improvement. The following morning the dyspnea was much less, the cyanosis diminished and the patient more alert. The improvement was remarkable. October 26, at 5:30 p. m., another intravenous injection was made of 100 c.c. of serum after preliminary phlebotomy of 50 c.c. of blood. The temperature promptly reached normal, and recovery continued uneventful.

CASE 2.—R. L. B. was admitted to the hospital, October 14. October 20, his left chest showed dulness and bronchial breathing below the level of the fourth rib; the right chest was slightly less involved. October 24, the patient appeared moribund. The white blood count was 7,900 per cubic millimeter. The temperature ranged about 102 F. There was extreme dyspnea, marked delirium, cyanosis and rapid, bounding pulse. The condition seemed hopeless, with beginning pulmonary edema and overwhelming toxemia. At 11 p. m., 90 c.c. of immune serum were given. The following morning the temperature was 99.4 F., and in the afternoon it fell to 98 F. The toxemia still persisted, though the improvement following the serum injection was surprising. October 26, at 11 a. m., with the patient still toxic, an additional 70 c.c. of serum were given. Recovery thereafter was progressive.

* From the Medical Service, Base Hospital, Camp Zachary Taylor, Ky.

CASE 3.—H. L., admitted to the hospital, October 9, developed pneumonia soon after. The temperature varied between 102.4 and 104.6 F. Roentgenoscopy revealed spot shadows throughout the right lung. The sputum showed pneumococcus Type IV. October 25, the temperature was 102; there was evidence of marked toxemia; marked dyspnea and cyanosis, delirium and jaundice. At 11:30 a. m. an intravenous injection of 80 c.c. of serum was given. The patient's condition continued unchanged for three days, during which the toxemia increased, the jaundice was marked, and the fever continued. October 28, at 2 p. m., a second injection of 100 c.c. was given, and this was repeated at 10 a. m. the following day. The patient improved promptly, and recovery was uneventful.

CASE 4.—C. C., admitted to the hospital with influenza, September 27, developed bronchopneumonia. Roentgenoscopy revealed shadows in the lower right lung and the middle portion of the left lung. The temperature varied between 102 and 103. October 22, the condition was very critical; the patient was semiconscious. His temperature was 102, with marked dyspnea and cyanosis. At 3:30 p. m., 100 c.c. of serum were injected intravenously. The following morning the temperature fell to 100.8 F. At 10 a. m., 100 c.c. of serum were again given. The patient still remained toxic and irrational. At 10 a. m., October 25, 100 c.c. of serum were again given. The patient's recovery seemed irrefutably prompted by the use of the convalescent serum.

CASE 5.—W. M. S., aged 27, admitted to the hospital, September 30, developed bronchopneumonia later, and on October 22 appeared to be moribund. He was semiconscious, toxic, dyspneic and cyanosed, and meningeal involvement was suspected. At 9 p. m. on that day, 100 c.c. of serum were given intravenously. The patient seemed much improved the following morning, and his recovery was progressive after the one injection.

SUMMARY

1. Twenty-five patients with clinically grave prognosis, toxemia, extreme dyspnea and cyanosis and extensive lung involvement were treated with serum from convalescent influenzal bronchopneumonia patients.

2. The mortality, as determined from the final disposition of the patients in this series, was twelve, or 48 per cent.

3. Eighteen other patients with prognosis equally grave clinically were used as controls and treated like the others, but without the use of serum.

4. The mortality in this series was twelve, or 66.6 per cent.

5. The selection of the most severely ill patients was deemed more correct for judging the value of the immune serum than the selection of a series of consecutive patients, the larger number of whom would recover without the use of the serum.

6. From the relative percentage mortality in the two series as well as from the surprising beneficial effects of the serum in individual cases, we believe that serum from convalescent influenzal bronchopneumonia patients deserves further trial in the treatment of the disease.

7. It may perhaps act as a favorable antitoxic factor in the circulation to assist in the general reaction to the pathologic process.

8. It must be emphasized that the number of cases in this series does not warrant very positive conclusions.

The Alkaline Reserve in Shock.—In shocked men there is a reduction of the so-called "alkaline reserve" of the blood, that is, the amount of sodium bicarbonate present. This is due to the development of nonvolatile acids which unite with the sodium and drive off the carbon dioxid.—*Review of War Surgery and Medicine.*

PHYSICAL EXERCISES IN USE IN THE CARDIOVASCULAR SERVICE

GENERAL HOSPITAL NO. 9, LAKEWOOD, N. J.

BERTNARD SMITH, M.D. (LOS ANGELES)
Captain, M. C., U. S. Army

LAKEWOOD, N. J.

The exercises here reported were planned for the training of soldiers with "irritable heart," and they have been used for a sufficient length of time to prove their value in physical development and in estimating

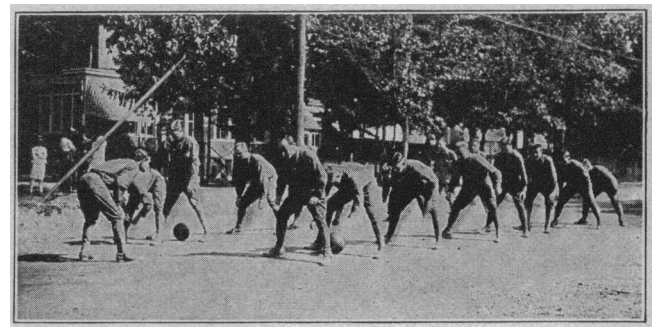


Fig. 1.—Stride ball relay, for advanced grades.

the fitness of the men for military service. Tests of muscular strength have shown that a large proportion of the men, sent to this hospital on account of the symptoms that characterize the "irritable heart of soldiers," are of poor muscular development. They give, also, a history of having lived, in civil life, at a physical level considerably below that at which their symptoms appear. In many instances the situation is complicated by the fact that for years their families and physicians have continually impressed on them the idea that they must "take it easy," and never "overexert," on the

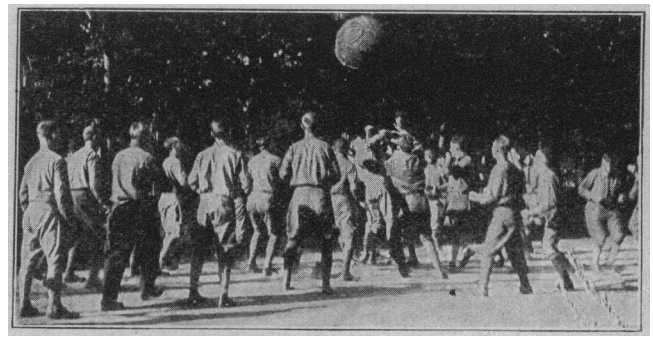


Fig. 2.—Push ball, for advanced grades.

grounds that they were "not strong" or that they had a "weak heart." The main problem, in such cases, is to improve the general physical condition of the patients, and but little progress can be made in this direction until they begin to get some self-confidence, and realize that even if they do get tired, short of breath or have some pain in the chest, nothing serious is going to occur. This type of individual must be gradually taught that it is safe for him to venture beyond what he has previously considered the limit of his physical activity. With this in view, the exercises of the first and second grades are given in slow rhythm, and care is taken to avoid short, snappy commands. The only part here carried out with anything like